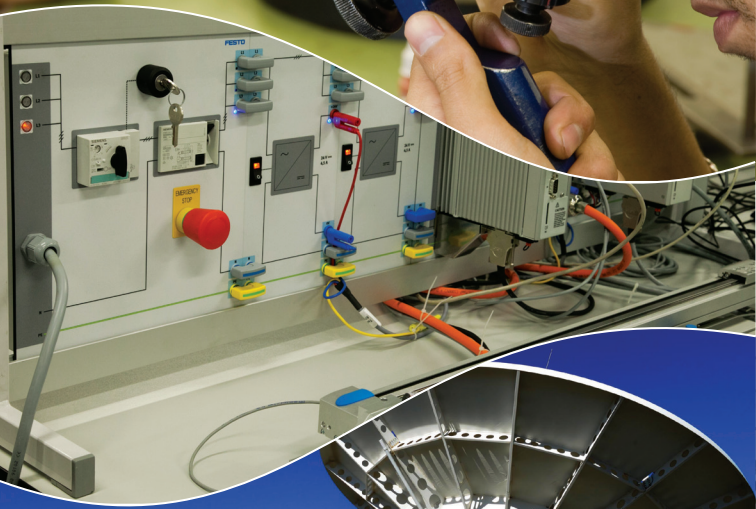


Science and Technology



The Department of Science and Technology (DST) executes its mandate through the implementation of the 1996 White Paper on Science and Technology, the national research and development strategy and the Ten-Year Innovation Plan. The plan aims to make science and technology a driving force in enhancing productivity, economic growth and socio-economic development.

The department's strategic goals are to:

- develop the innovation capacity of the national system of innovation to contribute to socio-economic development
- enhance South Africa's capacity for generating knowledge to produce world class research outputs and turn some advanced findings into innovation products and processes
- develop appropriate human capital in the science, technology and innovation sector to meet the needs of society
- build world class infrastructure in the science, technology and innovation sector to extend the frontiers of knowledge, train the next generation of researchers, and enable technology development and transfer as well as knowledge exchange
- position South Africa as a strategic international research and development and innovation partner and destination through the exchange of knowledge, capacity and resources between South Africa and its regional and other international partners, thus strengthening the national system of innovation.

To attract young people to science, the DST invested R497 million to implement a coordinated approach to science education, science awareness and science communication. The programmes – run through the South African Agency for Science and Technology Advancement – are expected to reach about 350 000 learners and about 12 500 to 13 000 teachers per year.

Research, Development and Innovation

This is at the heart of the department's efforts to drive innovation in scientifically strategic areas.

The programme has five subprogrammes:

- space science and technology
- hydrogen and energy
- biotechnology and health innovation
- innovation planning and instruments
- radio astronomy advances.

In November 2014, the DST officially launched the innovative 2,5 kW hydrogen fuel cell power generator prototype unit at the University of the Western Cape.

The generator demonstrates South Africa's innovative capabilities in the emerging hydrogen and fuel cell technologies space.

The prototype was developed by the HySA Systems Integration and Technology Validation Centre of Competence (HySA Systems) in collaboration with Hot Platinum (Pty Ltd), a local company involved in power management and control electronics.

Square Kilometre Array (SKA)

The SKA project could act as a catalyst for science, technology and engineering business opportunities, jobs and innovation, and has the potential to put South Africa and Africa on the map as a world Big Data and analytics hub.

The multibillion rand SKA will extend into eight African countries. It is also one of the biggest-ever scientific projects and multinational collaborations in the name of science. The project has already entered its first phase, with radio astronomy scientists and engineers finalising its design, with construction to start in 2016.

The radio telescope should be operationally mature by 2020. With thousands of linked radio wave receptors in Australia and in southern Africa, the SKA radio telescope will constantly scan space and feed the data to astronomers around the world. The amounts of data being collected and transmitted by the SKA in a single day would take nearly two million years to play back on an iPod. This means the project requires supercomputing power and Big Data management and analytics capabilities on an unprecedented scale.

The SKA is working with the world's most significant ICT powerhouses on the project.

One aspect of the project will see ASTRON, the Netherlands Institute for Radio Astronomy and IBM collaborating to research extremely fast, but low-power exascale computer systems, data transport and storage processes, and streaming analytics that will be required to read, store and analyse all the raw data that will be collected daily.

The SKA project will also have unprecedented data connectivity needs. Meeting the advanced technological and engineering needs of this project will result in significant local skills development, revolutionise science and technology

research and enable innovative new businesses and employment in the science, technology and engineering fields.

Aside from the benefits to African science, Big Data capabilities could be the biggest spin-off from the SKA project. The innovations, skills development and commercial potential emerging as a result of the project are huge. The potential is not just academic – the taxpayer-funded intellectual property (IP) is developed to a point where it is ready to become commercialised and benefit the economy.

Human capital development is already taking place as a result of the SKA project, with bursaries and scholarships being granted to allow students to learn the necessary cutting-edge science, technology, maths and engineering skills to support the project. Because the SKA is a long-term project over decades, its impact will increase. Going forward, there will be a strong drive to leverage the SKA as a spearhead for other programmes – including next generation high performance computing challenges and Big Data challenges.

National Bio-economy Strategy

In January 2014, the DST launched the South African Bio-economy Strategy, positioning bio-innovation as essential to the achievement of government's industrial and social development goals.

This science-based Bio-economy Strategy, which had been approved by Cabinet in November 2013, would replace the National Biotechnology Strategy, which had been in place since 2001.

The strategy would create an enabling environment that would allow government departments, industry, venture capital firms and other stakeholders to move forward with initiatives to meet the challenges and embrace the opportunities of the future.

The bio-economy concept is much broader [than that of the biotechnology strategy], looking at the entire value chain in a range of areas of possibility and opportunity, in response to South Africa's priority areas of need.

Through the Bio-economy Strategy, bioinnovation would be used to generate sustainable economic, social and environmental development. The DST was aiming to have biotechnology make up 5% of the country's gross domestic product by 2050.

The strategy focused on three sectors namely agriculture,

health and industrial applications and is also closely linked to other policies such as the Industrial Policy Action Plan, the National Development Plan and the New Growth Path.

A draft implementation plan for the strategy was completed by August 2014, after which it was passed through the DST and National Treasury's processes.

There were some regulations that did not support the Bio-economy Strategy that had to be dealt with in such a way that the people of the country were still protected, but without hampering development.

Council for Scientific and Industrial Research (CSIR)

The CSIR is one of the leading science and technology research, development and implementation organisations in Africa. The CSIR's main site is in Pretoria, Gauteng, and it is represented in other provinces of South Africa through regional offices. In 2015, the CSIR will be 70 years old.

The generation and application of knowledge reside at the core of the CSIR. This takes place in domains such as biosciences; the built environment; defence, peace, safety and security; materials science and manufacturing; and natural resources and the environment.

South African National Space Agency (Sansa)

Sansa was created to promote the use of space and cooperation in space-related activities while fostering research in space science, advancing scientific engineering through the development of South Africa's human capital and providing support to industrial development in space technologies.

The objectives of Sansa are to:

- promote the peaceful use of space
- support the creation of an environment conducive to industrial development in space technology
- foster research in space science, communications, navigation and space physics
- advance scientific, engineering and technological competencies and capabilities through human capital development outreach programmes and infrastructure development
- foster international cooperation in space-related activities.
- Sansa continues to provide state-of-the-art

ground-station services to many globally recognised space missions, such as the Nasa and Indian Space Research Organisation Mars missions, and Nasa's Orbiting Carbon Observatory-2, which is giving scientists a better idea of how carbon is contributing to climate change, answering important questions about where carbon comes from and where it is stored.



Research bodies

South African Bureau of Standards (SABS)

The SABS produces, maintains and disseminates standards. It promotes standardisation in business and government, and administers compulsory standards on behalf of the State. The SABS also certifies international quality standards.

Technology Innovation Agency (TIA)

TIA invests in the following technology sectors: advanced manufacturing, agriculture, industrial biotechnology, health, mining, energy, and information and communications technology.

National Intellectual Property Management Office (Nipmo)

Nipmo protects intellectual property emanating from publicly financed research and development from appropriation and ensure that it is available to the people of South Africa.

Agricultural Research Council (ARC)

The ARC conducts fundamental and applied research with partners to generate knowledge, develop human capital, and

foster innovation in agriculture by developing technology and disseminating information.

Mintek

Mintek, South Africa's national mineral research organisation, is one of the world's leading technology organisations specialising in mineral processing, extractive metallurgy and related areas.

Medical Research Council (MRC)

The MRC is an independent statutory body that coordinates health and medical research activities throughout South Africa.

National Research Foundation

The NRF provides services to the research community, especially at higher education institutions and science councils, with a view to promote high-level human capital development.

Human Sciences Research Council (HSRC)

The HSRC conducts large-scale, policy-relevant, social-scientific projects for public-sector users, non-governmental organisations and international development agencies.

National Advisory Council on Innovation (Naci)

Naci advises the Minister of Science and Technology on the role and contribution of innovation (including science and technology) in promoting and achieving national objectives.

Eskom

Eskom's Technology Services International group is a multidisciplinary industrial laboratory and consulting organisation.

Sasol

Sasol's culture of innovation began in the 1950s when it developed its unique blend of coal gasification and Fischer-Tröpsch (FT) technology for its original coal-to-liquids operations at Sasolburg. Focused FT research and development in the 1980s and 1990s led to the development

of the low temperature FT Sasol Slurry Phase process used at Sasolburg, and the high-temperature Sasol Advanced Synthol™ process used at Secunda.

ArcelorMittal

ArcelorMittal, a global steel-maker, is a leader in research and development and technology; holds sizeable captive supplies of raw material, and operates extensive distribution networks with an industrial presence in 27 countries.

National Health Laboratory Service (NHLS)

The NHLS forms a national network of integrated pathology laboratories throughout the country. All NHLS laboratories provide laboratory diagnostic services to the Department of Health, provincial hospitals, local authorities and medical practitioners.

Bureau for Economic Research (BER)

The BER, located at the University of Stellenbosch, Western Cape, renders a service to organisations ranging from small one-person businesses to policy-makers at the highest level of government.

National Institute for Tropical Diseases

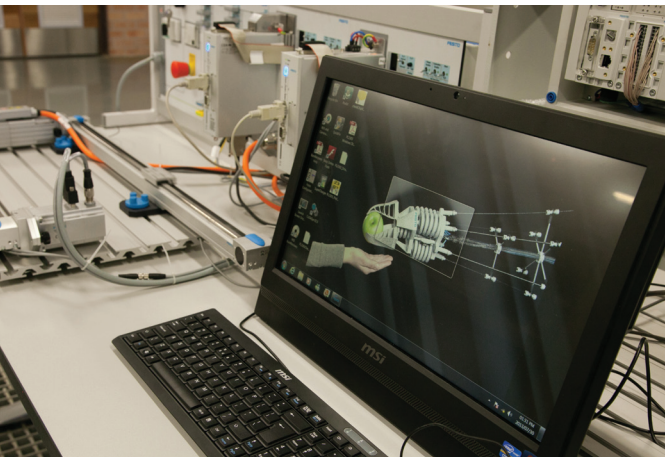
The National Institute for Tropical Diseases in Tzaneen, Limpopo, is responsible for the ongoing assessment of malaria-control programmes carried out by various authorities in South Africa. A malaria-reference service is also provided. Malaria tests are carried out by the institute, and statistical analyses of data pertaining to the programme is undertaken.

South Africa's National Energy Development Institute (Sanedi)

The departments of science and technology, minerals and energy are joint custodians of Sanedi and assist in providing political and strategic focus for the company. The institute is entrusted with the coordination and undertaking of public interest energy research, development and demonstration.

Mine-safety research

The Safety in Mines Research Advisory Committee is a statutory tripartite subcommittee of the Mine Health and Safety Council. It has a permanent research-management office managing the engineering, rock engineering and mine occupational health fields of research.



National Agricultural Research Forum (Narf)

Narf coordinates agricultural research and development within the national agricultural research system.

Water Research Commission

The main areas of research are surface hydrology, groundwater, hydrometeorology, agricultural water-use, water pollution, municipal effluents, industrial water and effluents, drinking water, membrane technology, water ecosystems, hydraulics, mine-water management, water policy, developing communities and the transfer of technology.

Institute for Water Research (IWR)

The IWR is a multidisciplinary research department of Rhodes University. Its main objective is to contribute to sustainable water-resource management in southern Africa.

Coastal and marine research

The NRF supports marine and coastal research in partnership with the Department of Environmental Affairs and the South African Network for Coastal and Oceanic Research. Sustainable use and the need to preserve future options in using marine ecosystems and their resources are guiding objectives in the research and advice provided by the chief directorate.

South African Environmental Observation Network (Saeon)

Saeon is a research facility that establishes and maintains nodes (environmental observatories, field stations or sites) linked by an information management network to serve as research and education platforms for long-term studies of ecosystems that will provide for incremental advances in the understanding of ecosystems and the ability to detect, predict and react to environmental change.

Biotechnology

South Africa's research institutions and universities are conducting biotechnology research to understand the nutritional components of food indigenous to South Africa, with the aim of making those with a high nutritional value available and accessible to the majority of people.

Academy of Science of South Africa (ASSAf)

ASSAf is the official national Academy of Science of South Africa and represents the country in the international community of science academies.

Africa Institute for South Africa (Aisa)

Aisa's mandate is to produce knowledge aimed at informing sustainable political and socio-economic development in Africa. Its vision is to be an indispensable African voice on African affairs.

Natural-resource development

South Africa's fluorspar chemicals sector has enormous economic potential. The DST has implemented a fluorochemicals development programme targeting human-capital development, new business formation and novel processes and products.

Women in Science Awards (WISA)

The WISA, which is part of government's efforts to recognise and create incentives for women scientists and researchers in the country and to profile successful women scientists, has been an annual event since 2003.

Top South African women scientists were honoured at the WISA ceremony in Johannesburg in August 2014. The top awards went to:

- Prof Priscilla Baker – Winner in the Distinguished Women Scientists category in Physical and Engineering Sciences.
- Prof Marina Rautenbach – Winner in the Distinguished Women Scientists category in Physical and Engineering Sciences.
- Prof Jeanet Conradie – Runner-up in the Distinguished Women Scientists category in Physical and Engineering Sciences.
- Prof Leila Patel – Winner in the Humanities and Social Sciences category.
- Prof Marie Poggenpoel – Winner in the Humanities and Social Sciences category.
- Prof Naydene de Lange – Runner-up in the Humanities and Social Sciences category.
- Ms Tlhompho Gaoshebe awarded Fellowship in the Master's Degree category.
- Ms Caroline Pule awarded a Fellowship in the Doctoral Degree category.
- Ms Mpho Ivy Raborife awarded a Fellowship in the Doctoral Degree category.
- Ms Kwezikazi Mkentane awarded a Fellowship in the Doctoral Degree category.
- Ms Cynthia Joan Henley-Smith awarded a Fellowship in the Doctoral Degree category: Indigenous Knowledge Systems.
- Ms Theresa Beelders awarded a Fellowship in the Doctoral Degree category: Indigenous Knowledge Systems.
- Dr Puleng Segalo – Winner in the Distinguished Young Women Scientists category: Human and Social Sciences.
- Prof Matseliso Mokhele – First runner-up in the Distinguished Young Women Scientists category: Human and Social Sciences.
- Prof Petro du Preez – Second runner-up in the Distinguished Young Women Scientists category: Human and Social Sciences.
- Dr Nosipho Moloto – Winner in the Distinguished Young

Women Scientists category in Physical and Engineering Sciences.

- Ms Lungile Sitole awarded a Fellowship in the Doctoral Degree category.
- Ms Kgothatso Nhlengetwa awarded a Fellowship in the Master's Degree category.
- Ms Nosipho Dlamini awarded a Fellowship in the Master's Degree category: Indigenous Knowledge Systems.
- Ms Jinal Nomathemba Bhiman awarded Fellowship in the Doctoral Degree category.
- Ms Fatimah Mansoor awarded Tata Scholarship in the category Master's Degree.
- Ms Anna Hlabe awarded Tata Scholarships in the category Master's Degree.
- Ms Maletsabisa Tšabi Molapo awarded Tata Scholarship in the category Doctoral Degree.
- Ms Fortunate Nonhlanhla Yende-Zuma awarded Tata Scholarship in the category Doctoral Degree.
- Ms Beverly Mmakatane Mampholo awarded Tata Scholarship in the category Doctoral Degree.
- Ms Grace Ngubeni awarded Tata Scholarship in the category Master's Degree.
- Prof Genevieve Langdon – First runner-up in the Distinguished Young Women Scientist in Physical and Engineering Sciences.
- Prof Michelle Kuttel – Second runner-up in the Distinguished Young Women Scientist in Physical and Engineering Sciences.